Evaluating and Conserving Biodiversity at Mid-Scales

The devil is in the details

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What is mid-scale?

- About 100,000 (watersheds) to about 1 million hectares (a few subbasins)
- Fine-scale – stands, subwatersheds
- Broad-scale regions – several million hectares and larger

Example Mid-Scale Biodiversity Analysis

- Forestry Program for Oregon biodiversity indicators: species level & habitat level
- Coastal Landscape Analysis and Modeling Study
- Some thoughts on issues and solutions

Forestry Program for Oregon

Strategy E: Contribute to the conservation of diverse native plant and animal populations and their habitats in Oregon's forests.

E.a. Composition, diversity, and structure of forest vegetation

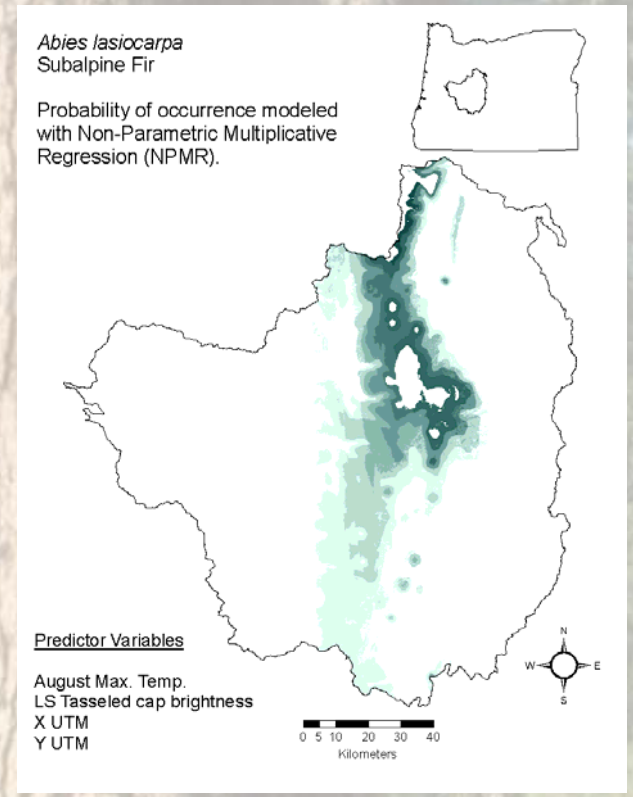
E.b. Extent of area by forest type in protected area categories

E.c. Forest plant and animal species at risk

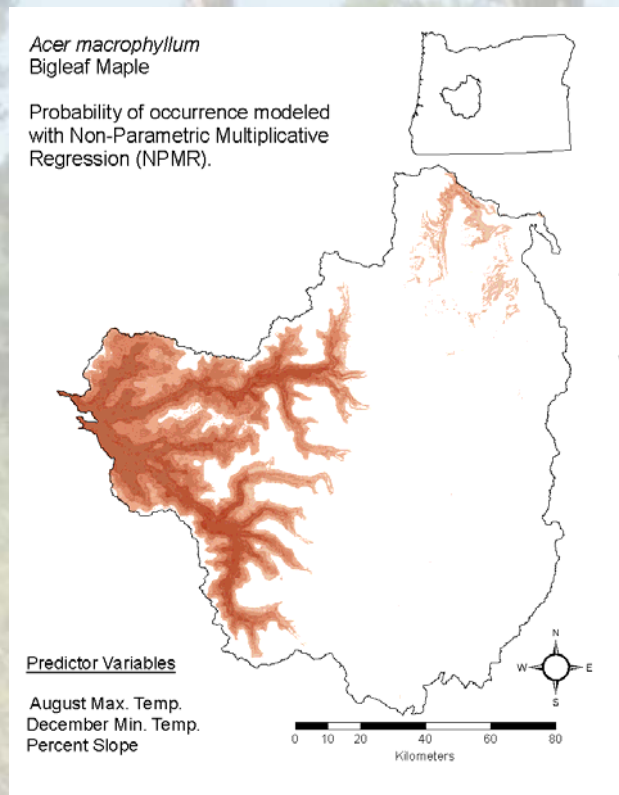
E.a. Composition, structure, diversity

- What are the plant species found in a sample of Oregon's forests?
- How does the diversity and composition of plant species vary across Oregon's forested landscape?
- What is the relationship between plant diversity, canopy cover, and forest community?
- What percentage of forest sampling sites contains invasive species?

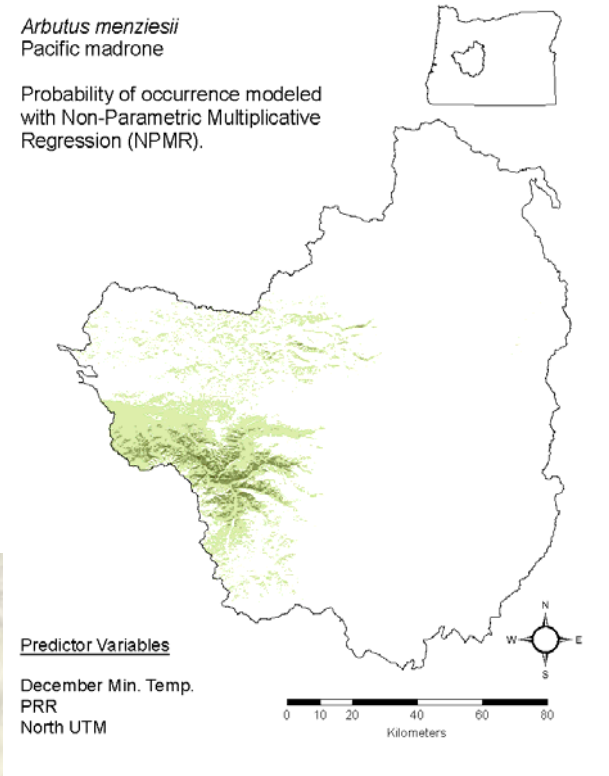
Subalpine fir



Bigleaf maple



Pacific madrone

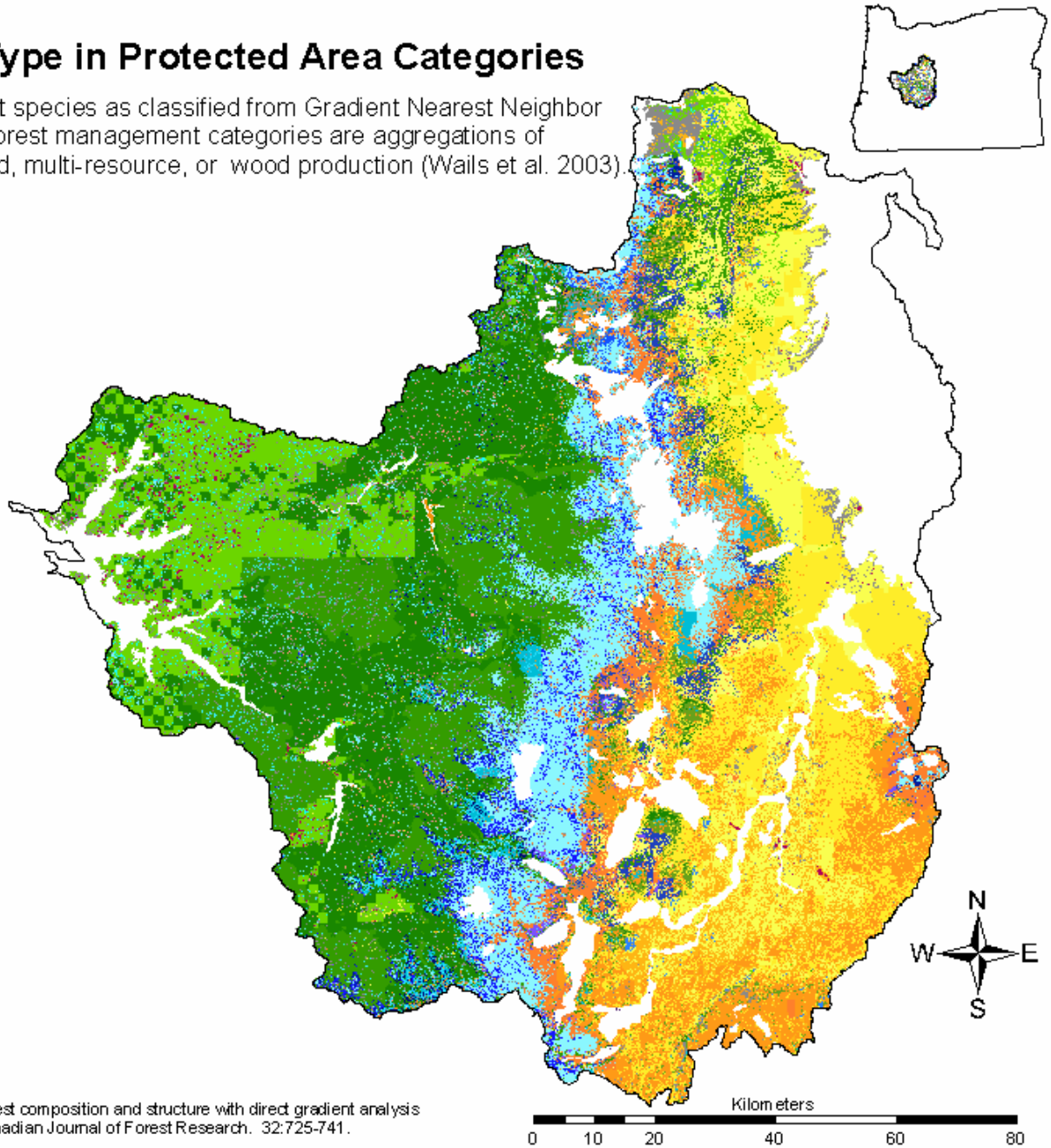


E.b. Extent of Area, By Forest Type in Protected Area Categories

This indicator provides the amount and spatial distribution of forestland area, in each major forest type, that is allocated to different levels of resource protection

Strategy E Indicator b
Extent of Area By Forest Type in Protected Area Categories

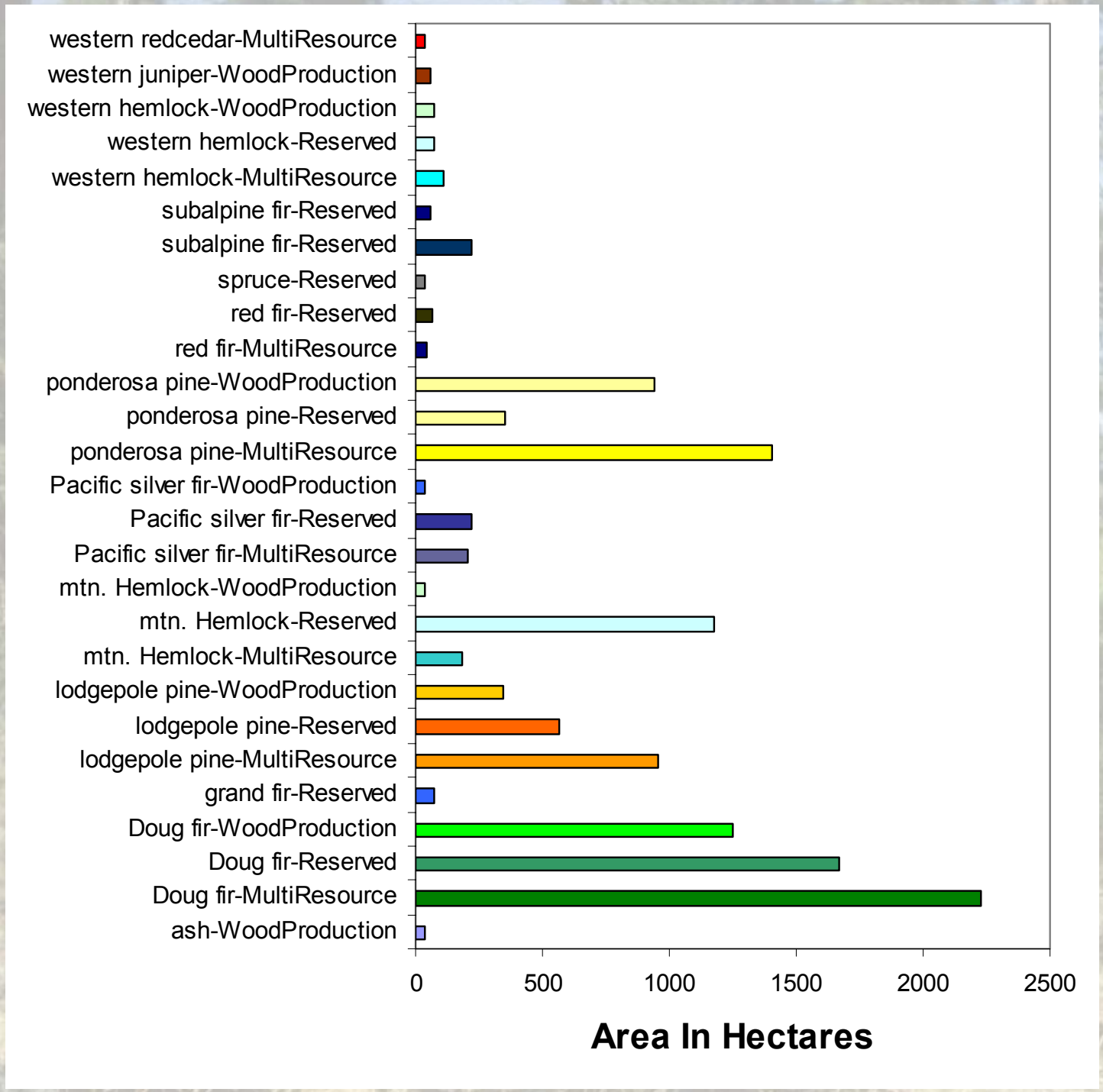
Forest Types are represented by dominant species as classified from Gradient Nearest Neighbor Analysis (Ohmann and Gregory 2002). Forest management categories are aggregations of forestland that can be considered reserved, multi-resource, or wood production (Wails et al. 2003).



Ohmann, J.L., Gregory, M.J. 2002. Predictive mapping of forest composition and structure with direct gradient analysis and nearest neighbor imputation in coastal Oregon, USA. Canadian Journal of Forest Research. 32:725-741.

Wails, G., Herstrom, A., Cannon, L., Birch, K. 2003. Protecting Oregon's forestlands: a graphical view. Oregon Forest Resources Institute. 317 SW Sixth Avenue, Suite 400, Portland, OR 97204.

map and analysis prepared by Andrew Yost


western redcedar-MultiResource
western juniper-WoodProduction
western hemlock-WoodProduction
western hemlock-Reserved
western hemlock-MultiResource
subalpine fir-Reserved
subalpine fir-Reserved
spruce-Reserved
red fir-Reserved
red fir-MultiResource
ponderosa pine-WoodProduction
ponderosa pine-Reserved
ponderosa pine-MultiResource
Pacific silver fir-WoodProduction
Pacific silver fir-Reserved
Pacific silver fir-MultiResource
mtn. Hemlock-WoodProduction
mtn. Hemlock-Reserved
mtn. Hemlock-MultiResource
lodgepole pine-WoodProduction
lodgepole pine-Reserved
lodgepole pine-MultiResource
grand fir-Reserved
Doug fir-WoodProduction
Doug fir-Reserved
Doug fir-MultiResource
ash-WoodProduction
0
500
1000
1500
2000
2500
Area In Hectares

E.c. Forest plant and animal species at risk

This indicator provides information on the status of plant, animal, and invertebrate species that are recognized by federal and state resource management agencies as at risk of extinction or losing significant sources of critical habitat in the future.

- USFWS endangered species listings
- Oregon Natural Heritage information
- NatureServe species lists

Coastal Landscape Analysis and Modeling Study

Major Objectives

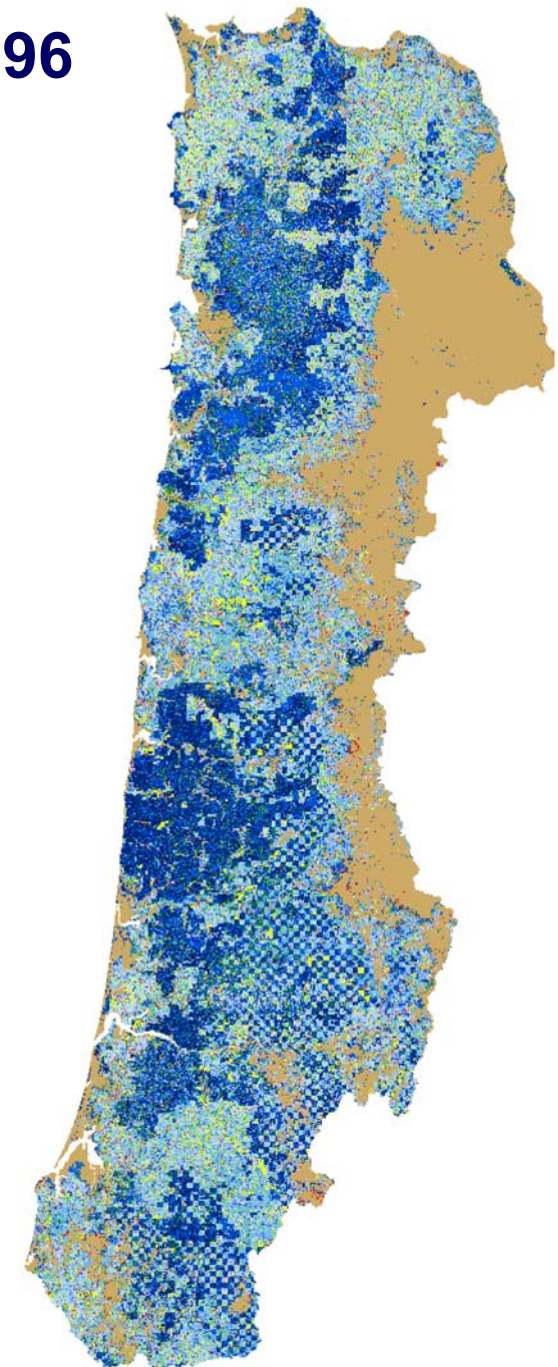
- Characterize spatial pattern and history of ecological and socio-economic components
- Project aggregate effects of current policies for 100 years
- Evaluate alternative policies
- Joint learning

CLAMS

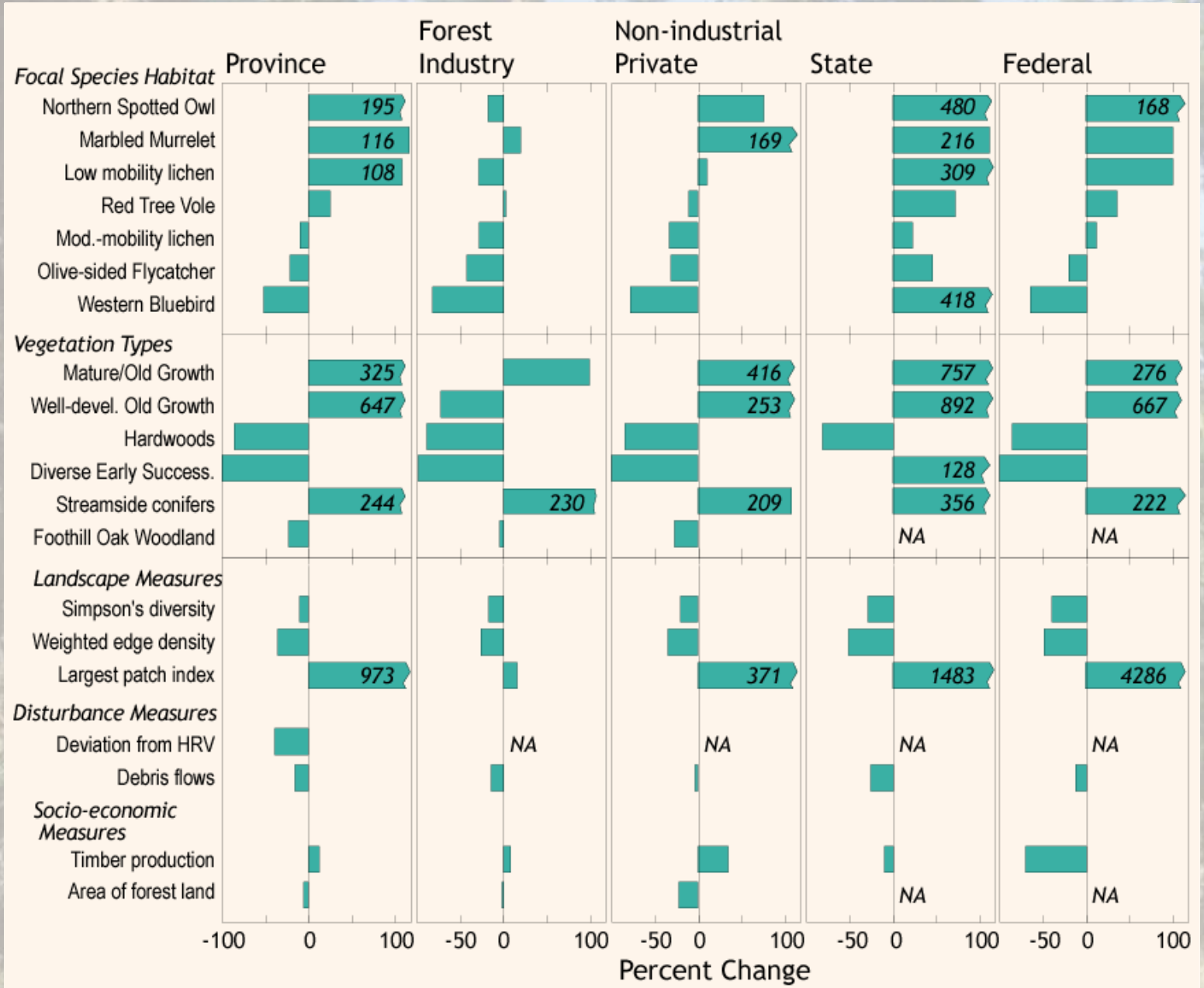
Vegetation Classes

- Not Simulated
- Open Forest
- Broadleaf
- Mixed Small
- Mixed Medium
- Mixed Large
- Mixed Very Large
- Conifer Small
- Conifer Medium
- Conifer Large
- Conifer Very Large
- Mixed Very Small
- Conifer Very Small
- Remnants

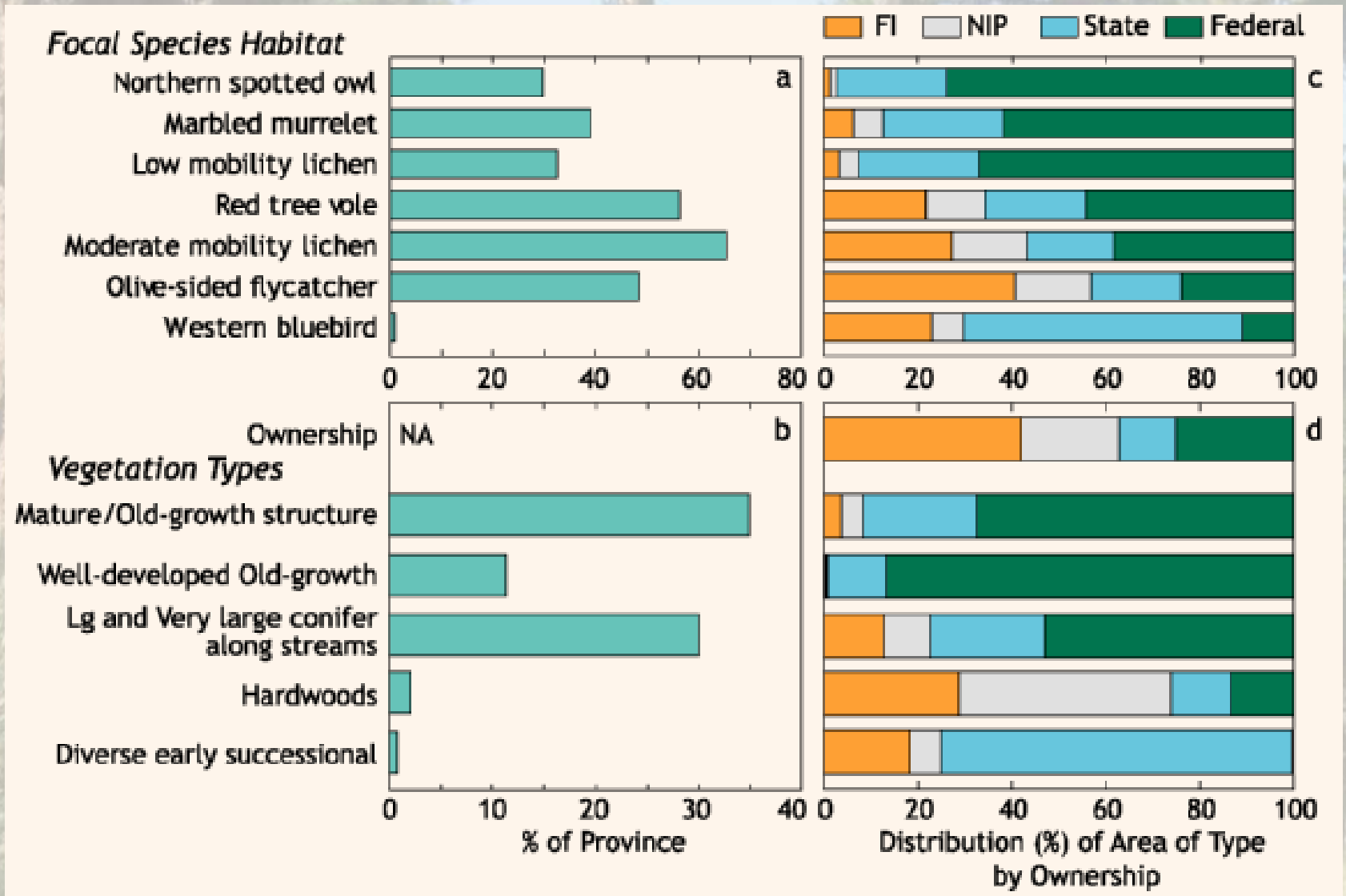
2096



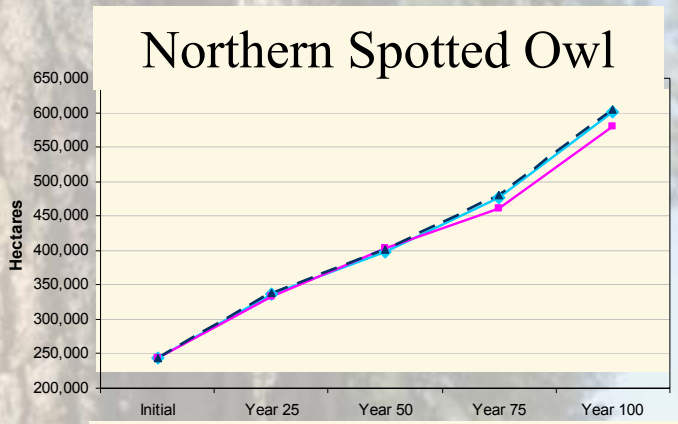
Changes in 100 years – Percent of Current

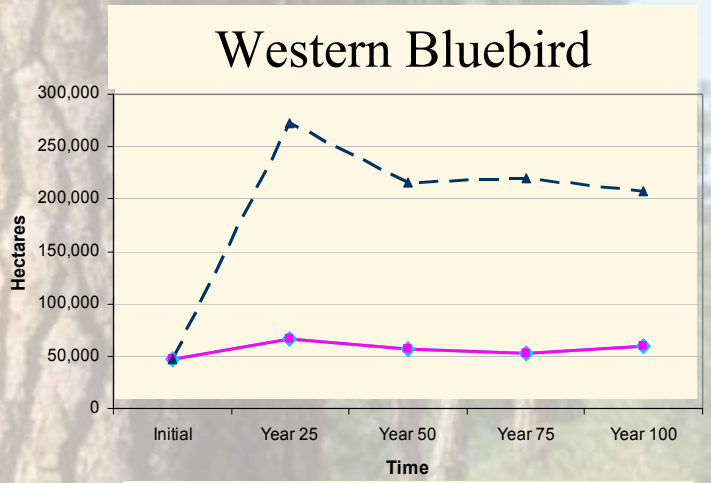


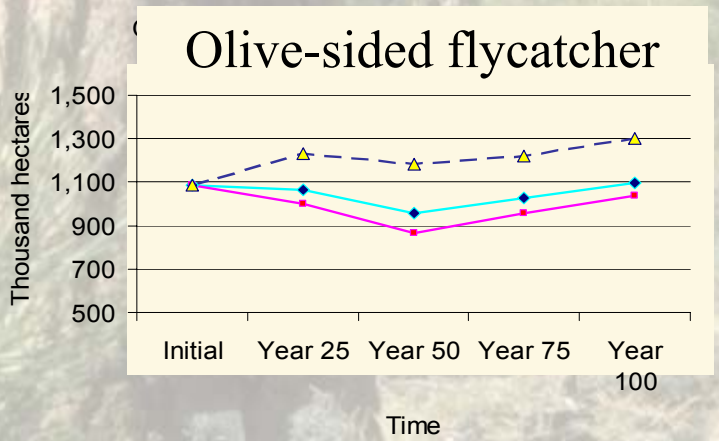
Projected Amounts and Distribution of Ecological Indicators at 100 years



Potential Effects of Alternative Scenarios on Bird Habitat







Current policy

Green tree retention

No Fed thinning

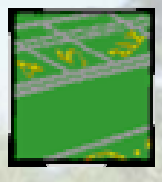
Issues

- How to select indicators?
- How to track species and habitats?
- What do we expect to happen?
- How to tell when real life does not meet our expectations?

The future is uncertain

Management changes

Local disturbances happen



The climate changes

Species move (e.g. barred owl)

It’s a crap-shoot and the dice are loaded

So…how about mid-scale conservation of biodiversity?

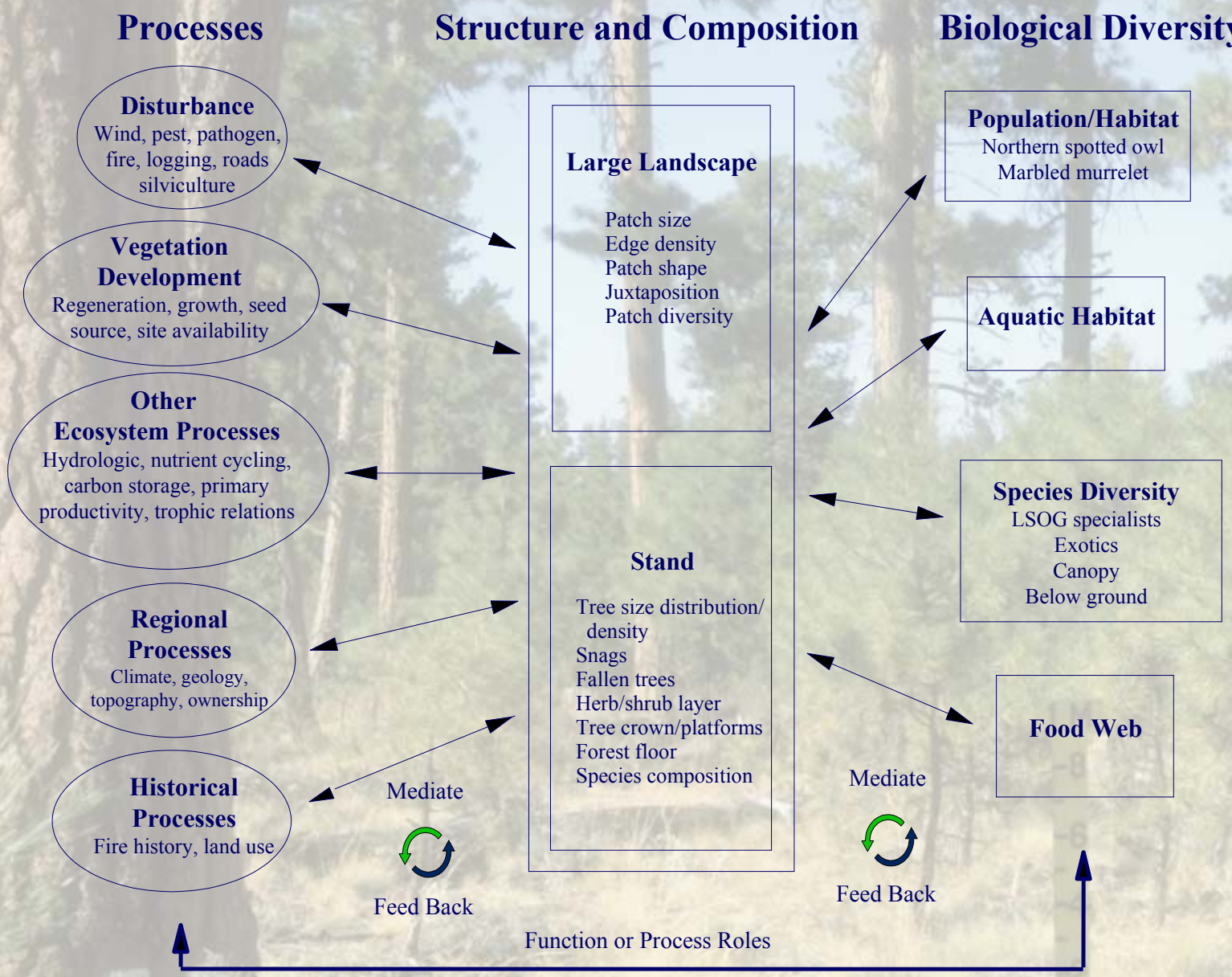
We know quite a bit about how the dice are loaded:

- Fire probabilities
- Vegetation growth
- Species habitats
- Management interests
- ….

We need several things:

- A conceptual model (how does the system work? What are the key agents of change?)
- A consideration of the role of chance
- Measurable indicators
- Monitoring and adaptation loop

Conceptual Model



From: Hemstrom, M.A. and others. 1998. Late-successional and old-growth forest monitoring plan for the Northwest Forest Plan. USDA Forest Service, Pacific Northwest Research Station, GTR-438. 37 p.

Conceptual Model

Agents of change

- Fire suppression & other human activities
- Climate change
- Invasive species
- Others…

Attributes of Interest

- Key features related to biodiversity
- Measurable attributes
- Expected trends
- Variability

Boxes and Arrows

(States and Transitions)

Vegetation Type A

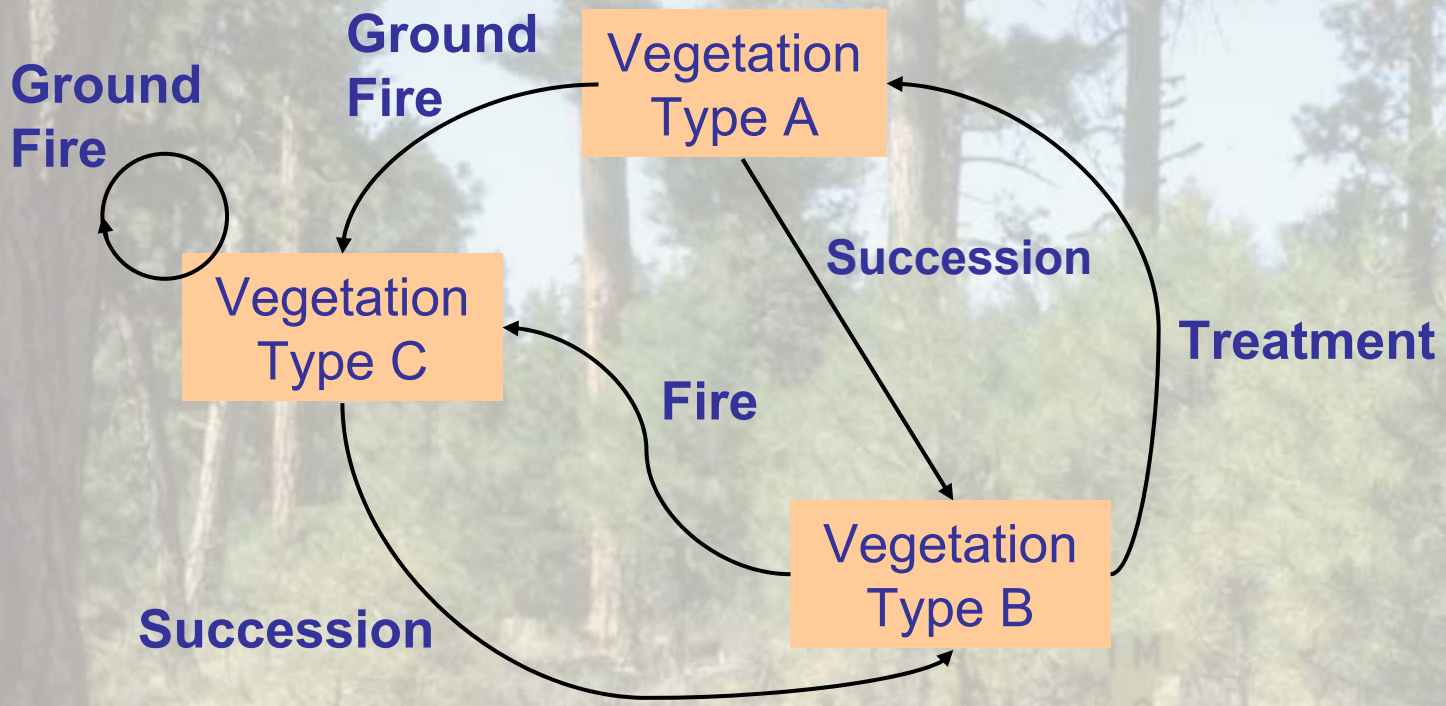
Cover type: Ponderosa Pine
Structure: Old single-story forest

Regeneration
Growth
Underburning

Vegetation Type B

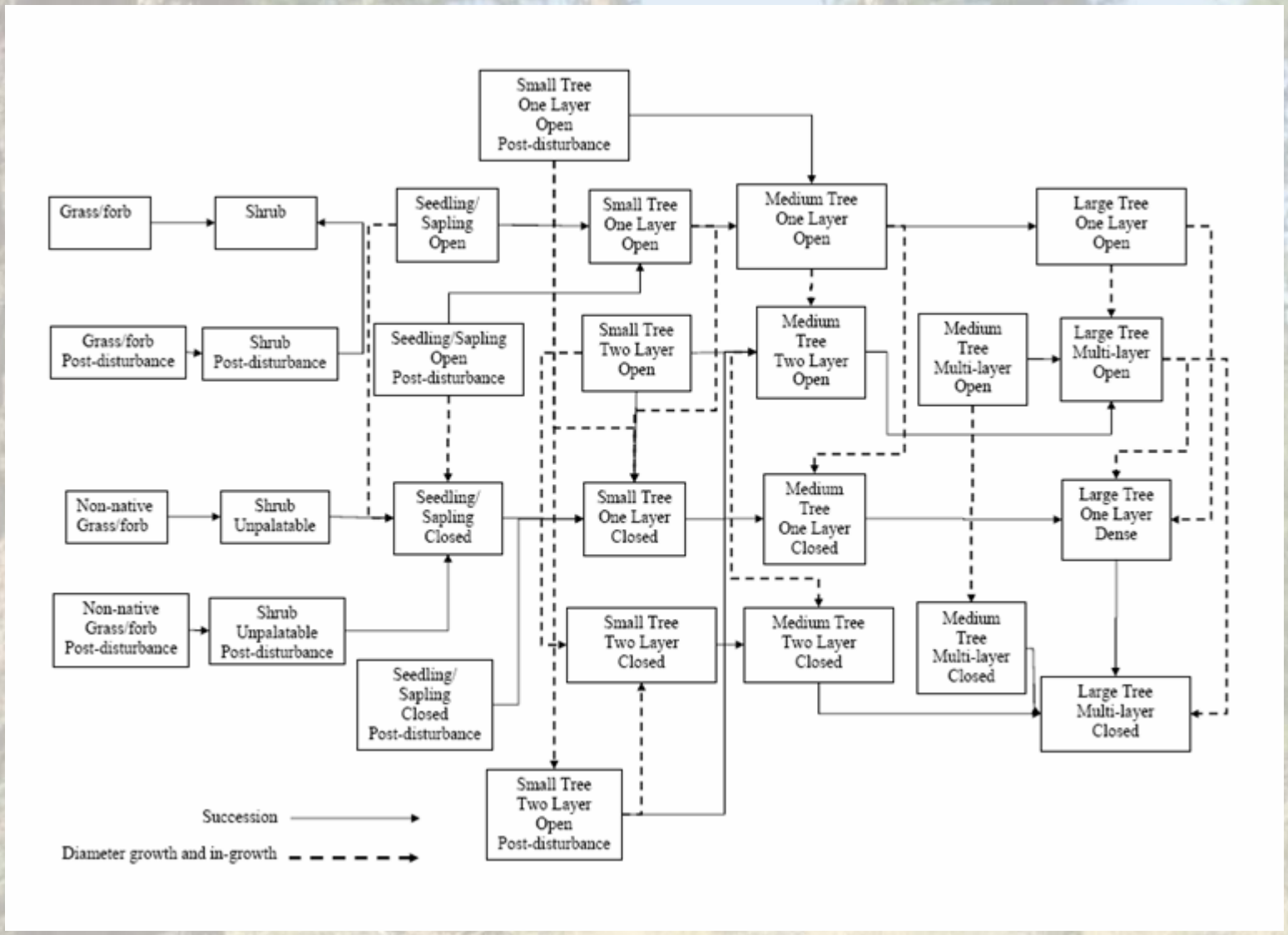
Cover type: Ponderosa Pine
Structure: Non-Stocked, Post disturbance

State and Transition Models

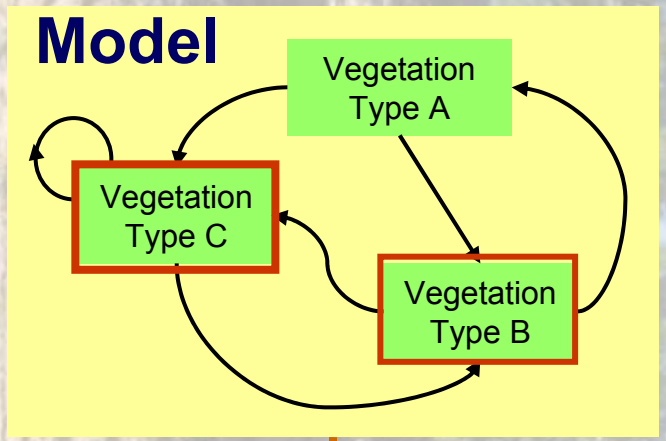


Vegetation Development Dynamics Tool (VDDT). www.essa.com

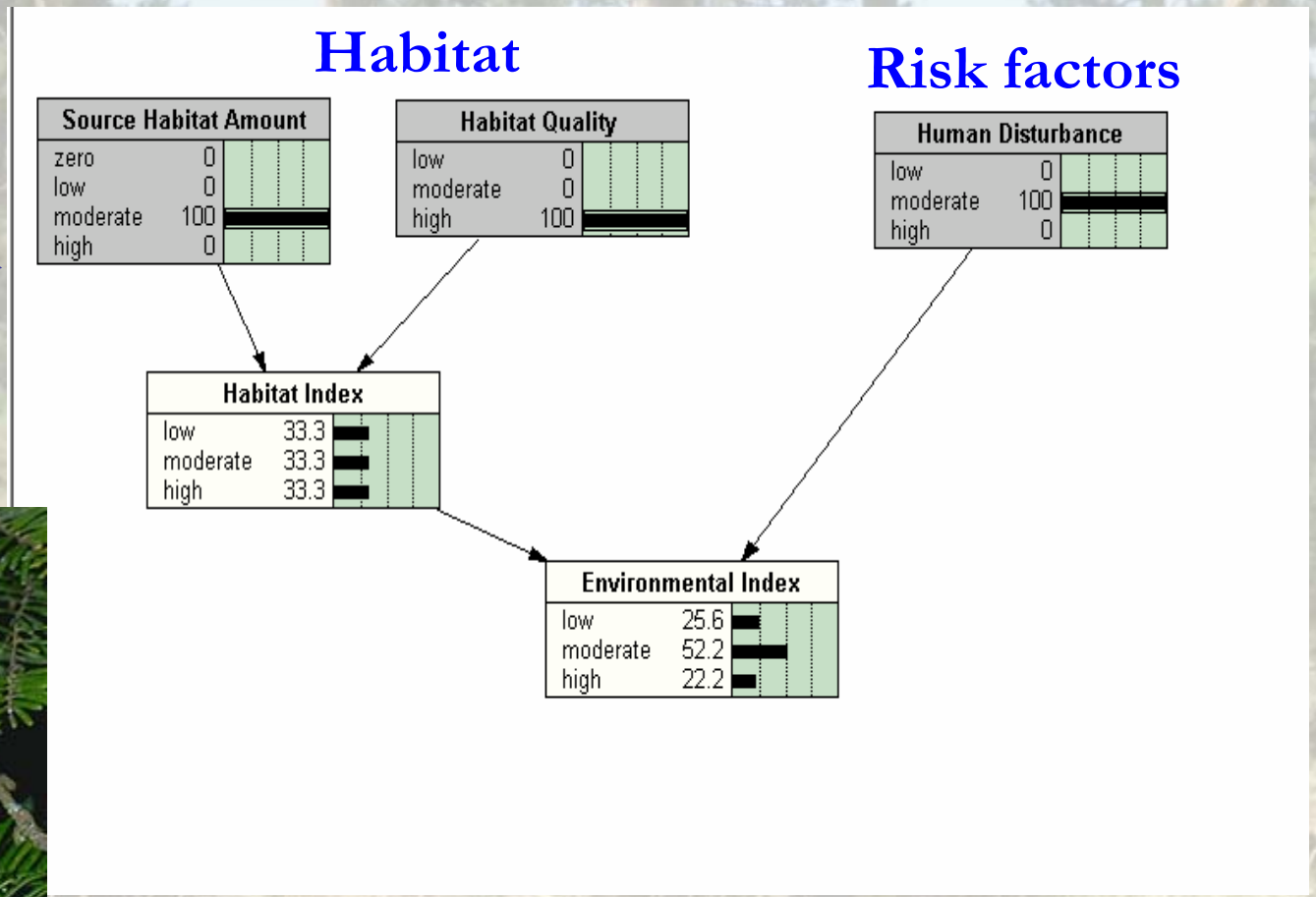
Conceptual model



Feature of Interest: Wildlife Habitat



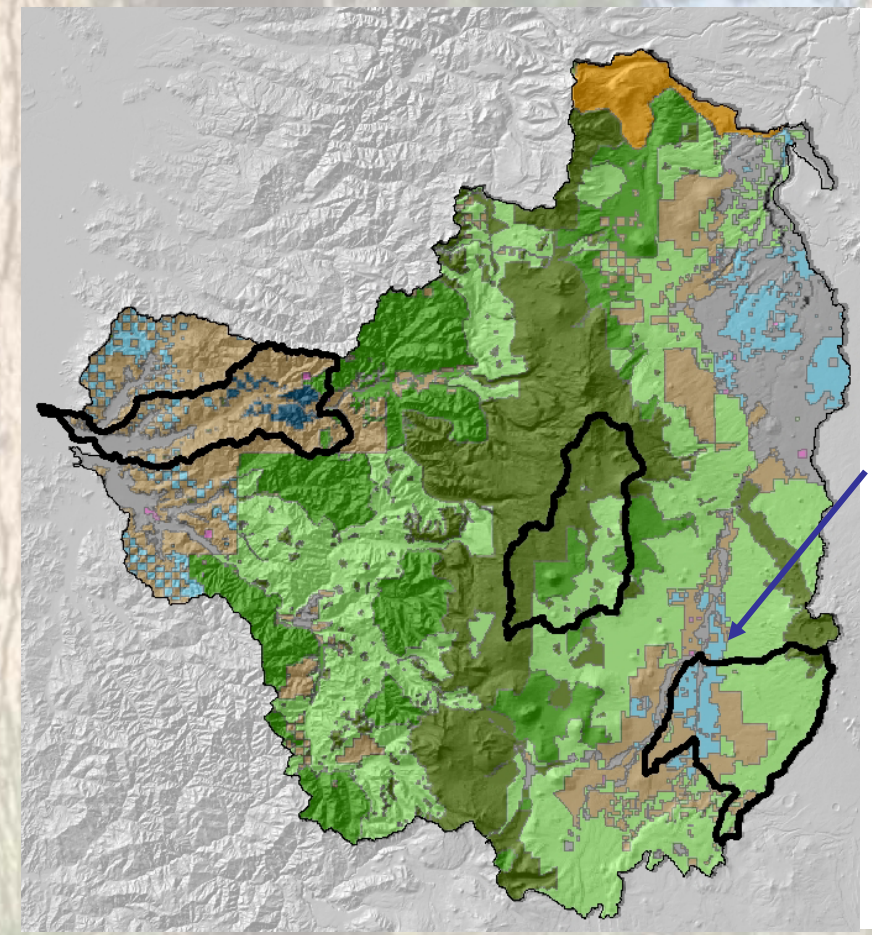
Acres & proportions

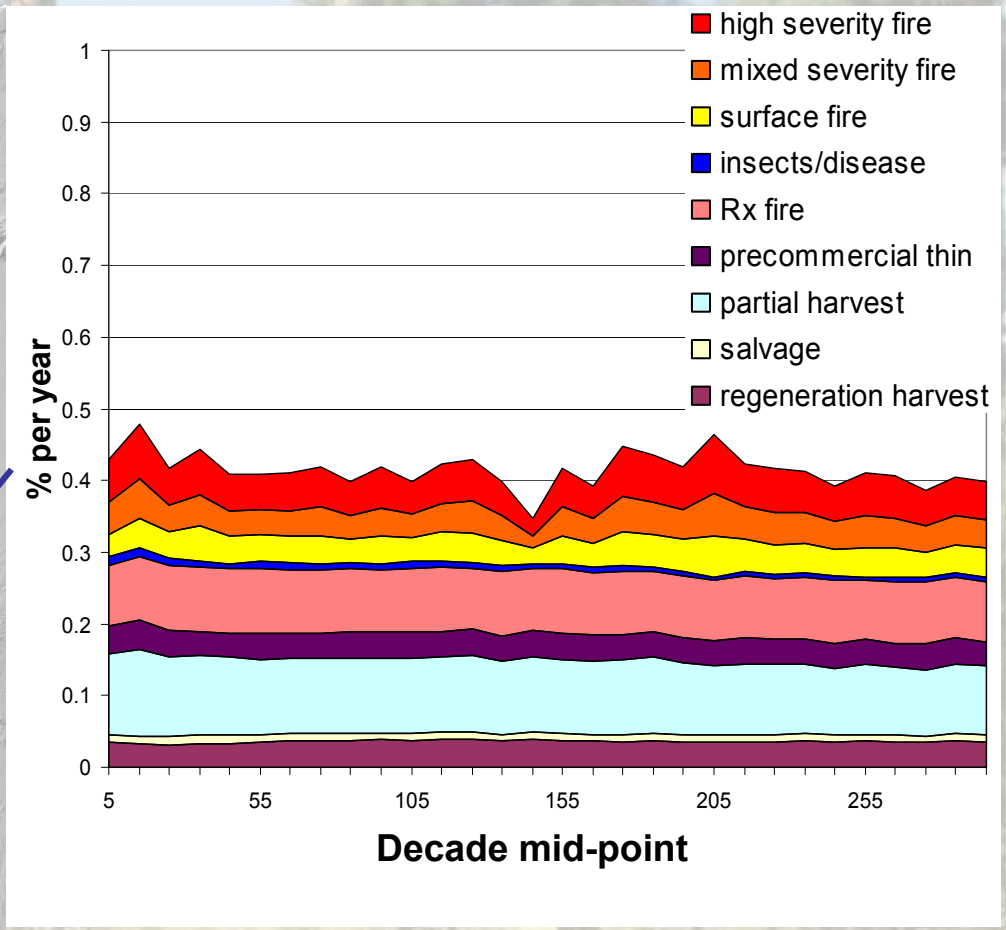


Projection Potential Future Conditions

- Stand level is often impractical.
- Variability, uncertainty, and the roll of the dice
- Scale dependent variability
- Change is the norm

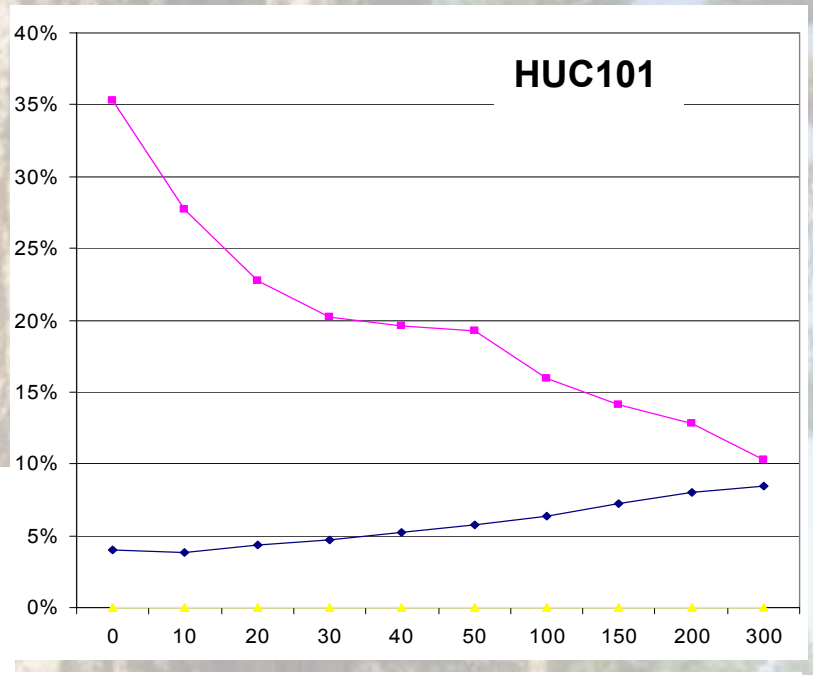
Disturbances – Scenario A

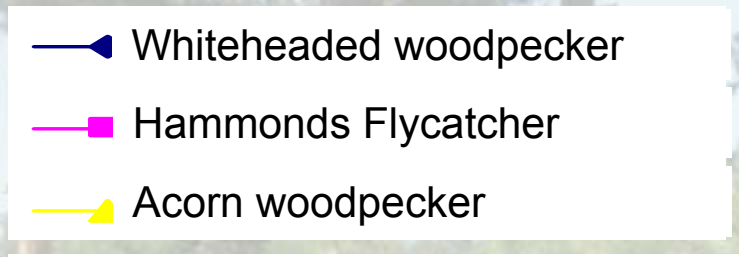




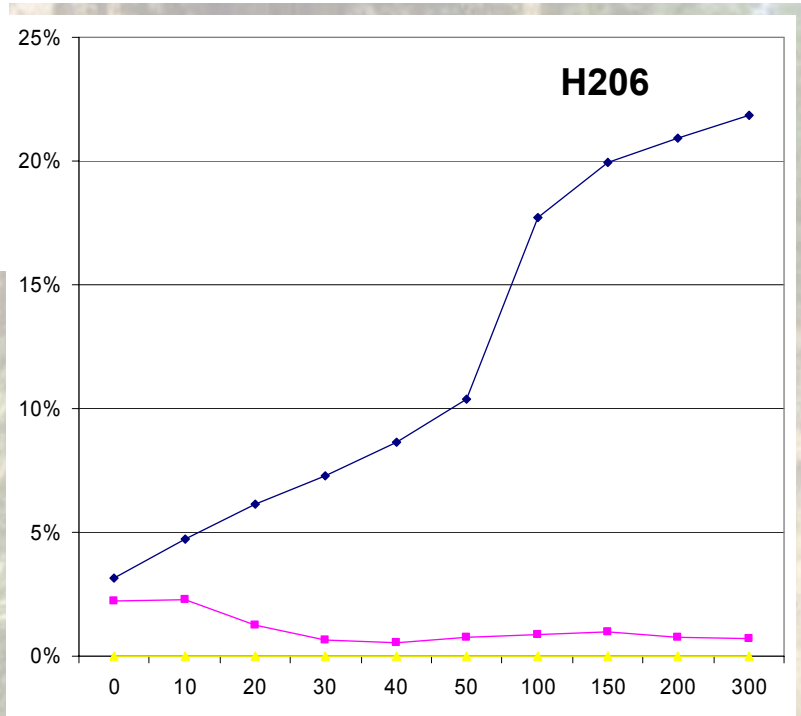
BLM general
FS general
FS policy reserves
Wilderness, etc.
Tribal
BLM policy reserves
Private industrial
Private non-industrial
Other

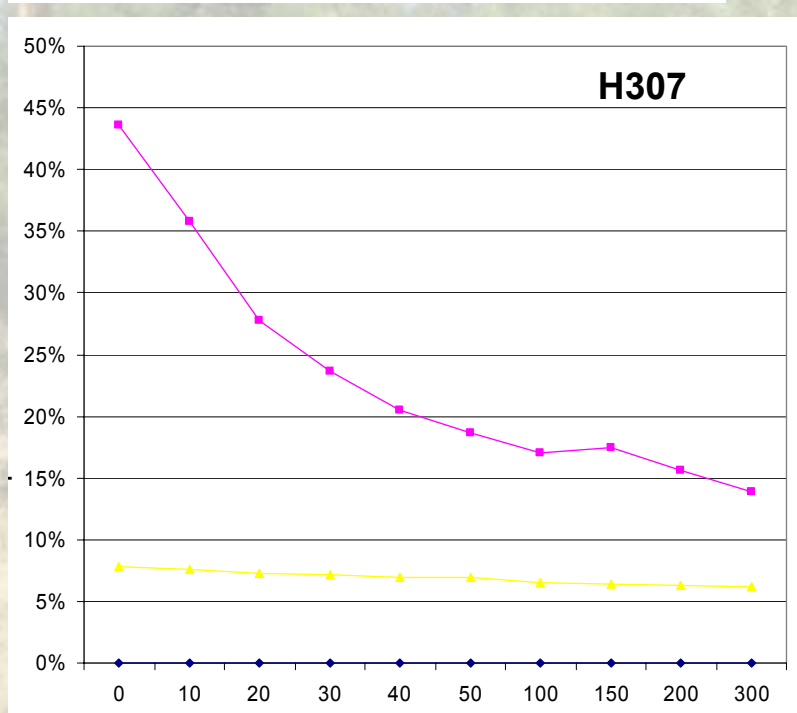
Focal Species Habitat





percent suitable habitat



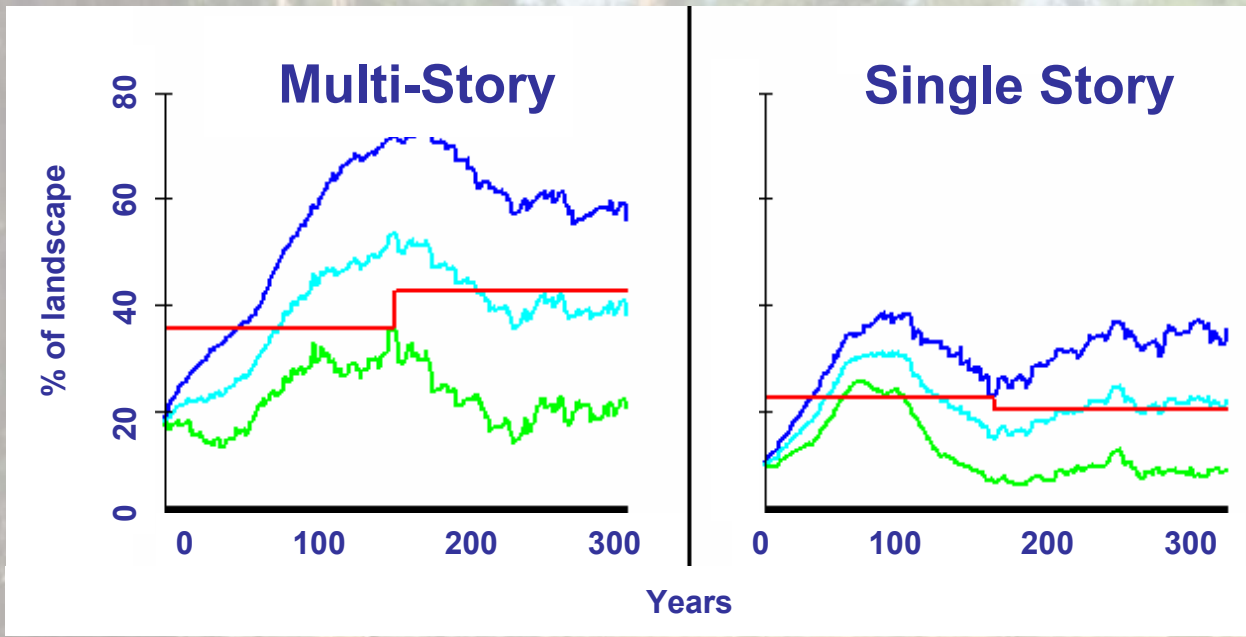


Include Probability



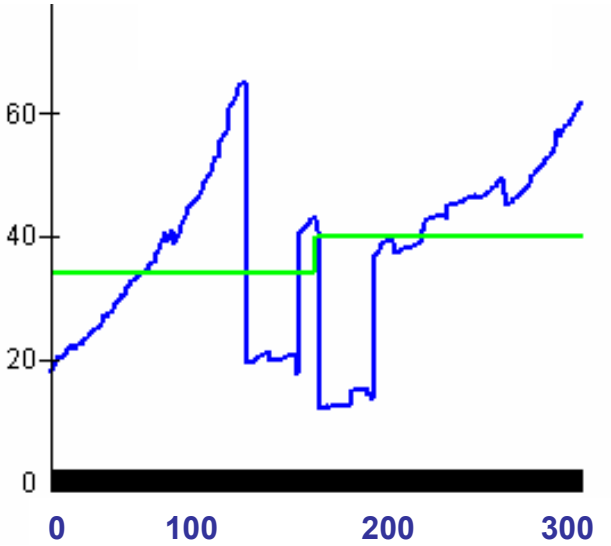

Large and Very Large Tree Habitat

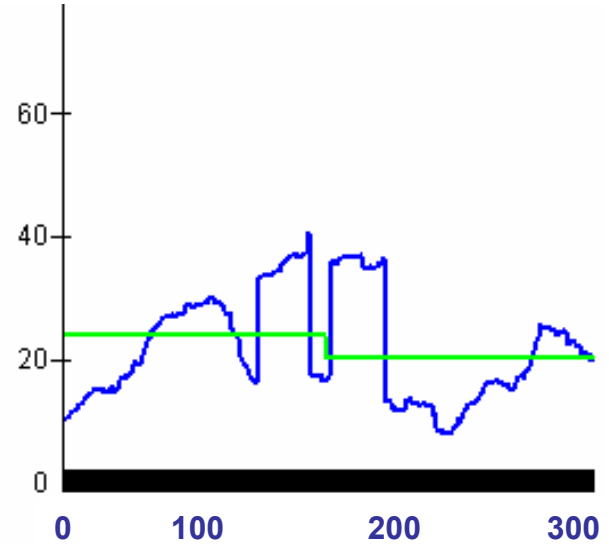
Future Range of Variability



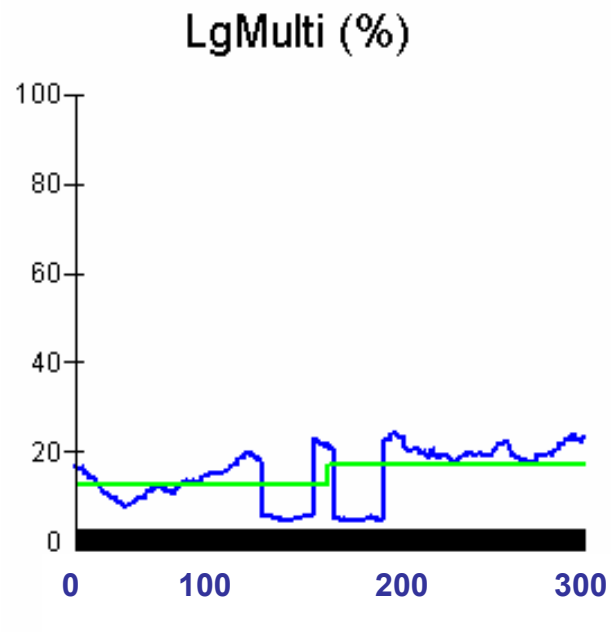
30 Runs

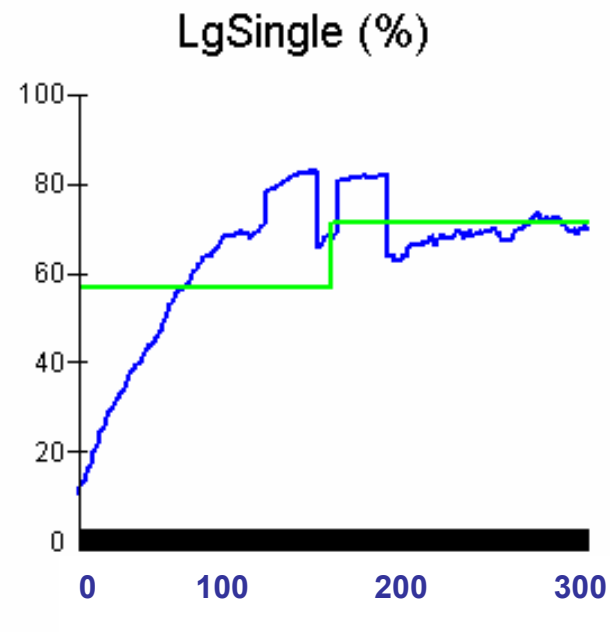
Future Range of Variability





Increase multi-story habitat

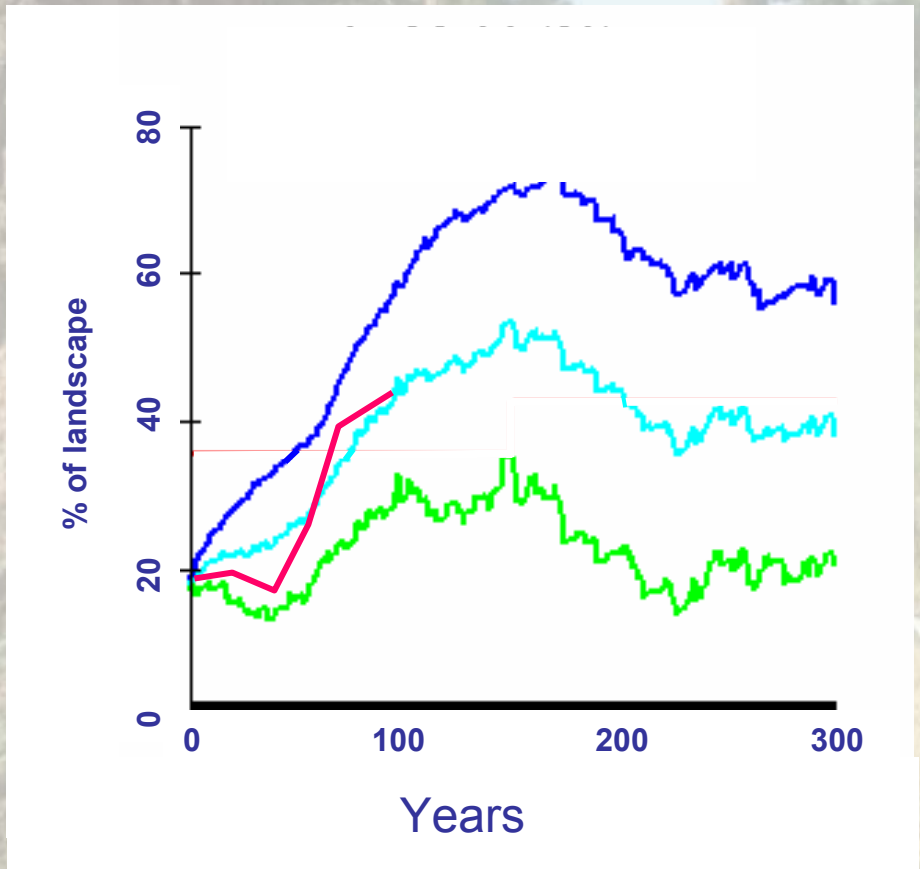




Move toward HRV

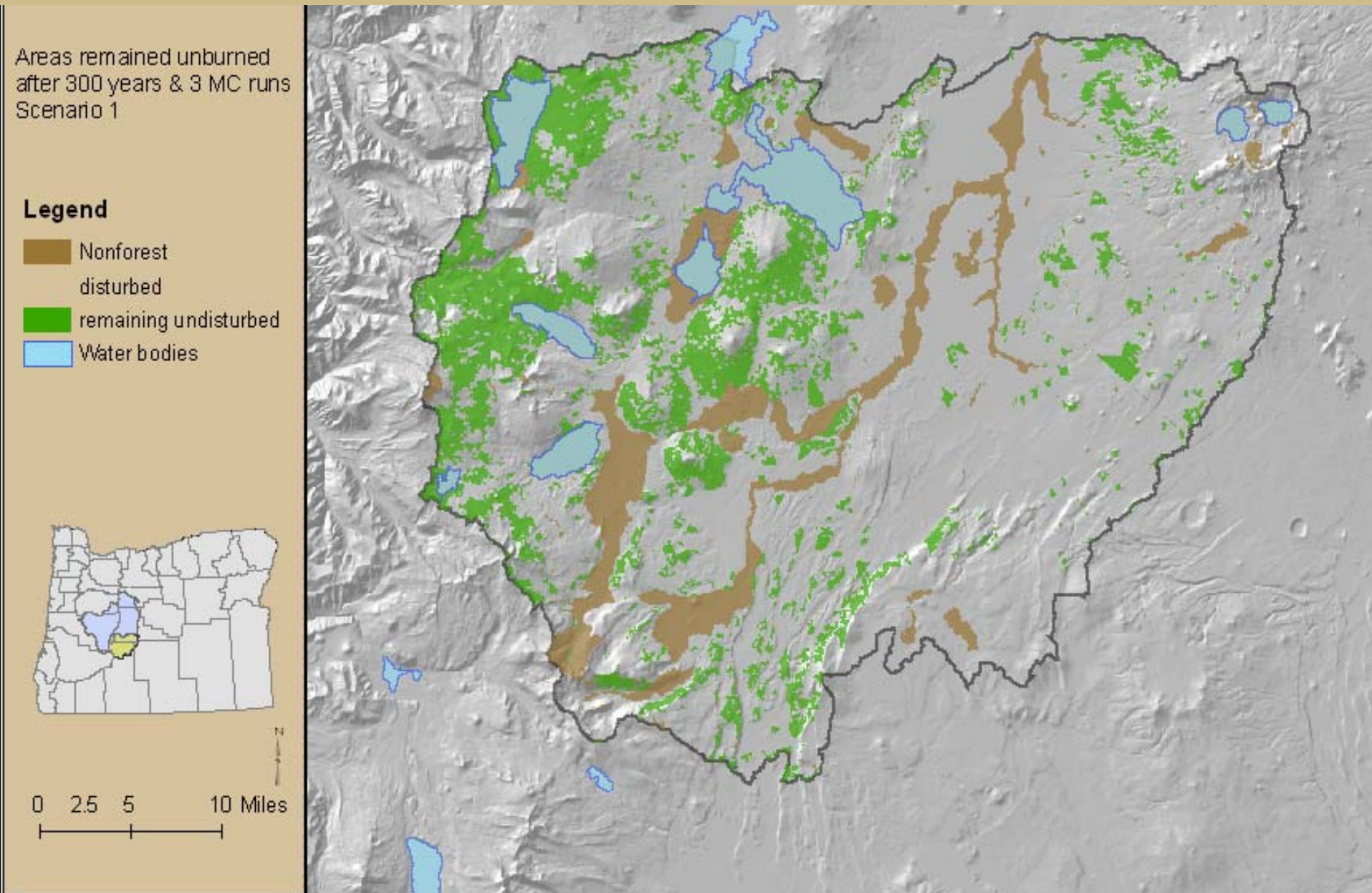
Time Lags

Important characteristics may change slowly or episodically



- Not much change in decade 1
- Decreasing in decade 2
- Bottomed out in decade 3
- Increasing to decades 4-10
- Within expected behavior?

Landscapes as probabilities



Monitoring and Adaptation

- Project potential future under scenarios
- Monitor important, key attributes
- Review and revise conceptual model
- Revise management
- Revise model and projections
- Repeat

Avoid the fine-scale trap

- People want or think they want fine-scale detail
- Geometrically increasing costs and intractability.
- Thinking you know more than you really do.